

XXV.—*Some Dragonflies and their Prey.*—II. *With Remarks on the Identity of the Species of Orthetrum involved.*
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IN an earlier volume of the *Ann. & Mag. Nat. Hist.* (ser. 8, vol. xiii. pp. 495–504; 1914) a number of cases were recorded illustrating the exact nature of the food consumed by adult dragonflies. More recently a series of observations on the same subject has been made in Nyasaland by Dr. W. A. Lamborn, while studying the bionomics of *Glossina* on behalf of the Imperial Bureau of Entomology. These observations were made at two points on the western shore of Lake Nyasa, and an account of them was published in the 'Bulletin of Entomological Research,' vol. vi. p. 252 (1915). The more northern locality—the Lingadzi River—was visited in February 1915, and Monkey Bay, some 60 or 70 miles to the south, in April and May of the same year. At each locality the dragonflies most frequently seen to take prey belonged to a single species of *Orthetrum*, and, as is usual with the African members of that genus, the determinations have proved to be a matter of some difficulty. The two species in question resemble one another very closely, and I can see nothing to separate them either in the form of the abdomen and the female genitalia, or in the coloration of the pterostigma, membranule, and the base of the hind wing. They may be distinguished, however, by certain differences in the male genitalia, and, taking these as the criterion, I call the series from the Lingadzi River *Orthetrum brachiale*, P. de B., while to the series from Monkey Bay I apply the name *O. chrysostigma*, Burm.

The shape of the hamule in the male is sufficiently constant for immediate recognition throughout each of the two collections. The Monkey Bay series has the form figured by Dr. F. Ris for *chrysostigma* (Coll. Selys, Libell. fasc. x. p. 206; 1909). That form seems to be the common one for the species, but I have seen specimens from West Africa which show that the hamule is subject to a certain amount of variation in this as in other species of the genus. It may be said, in passing, that the species here called *chrysostigma*, and figured by Ris under that name, is somewhat different in the form of the hamule from the type-material from Teneriffe. The difference will be appreciated when comparison is made with Calvert's figure of the genitalia of Burmeister's paratype (*Trans. Amer. Ent. Soc.* xxv. pl. i. fig. 11; 1898), in which the anterior branch of the hamule is represented as being "without any hook at tip, straight, blunt" (*loc. cit.* p. 86).

The only male of this species from the type-locality which I have had an opportunity of examining is the one from Teneriffe preserved in the British Museum (Natural History), and referred to by McLachlan in Journ. Linn. Soc., Zool. xvi. p. 177 (1882). The hamules of this specimen do not correspond very exactly either with the hamule figured by Calvert or with that figured by Ris, but recalls the hamule seen in one or two specimens belonging to a series in the National Collection from Prang, Northern Territories, Gold Coast, in which the hamules are particularly variable in form. This series has been examined by Ris, and referred to *Orthetrum chrysostigma* (Coll. Selys, Libell. fasc. xvi. (2) p. 1081; 1916-1919), although the white juxtahumeral band which especially characterizes that species is not very well defined in any of the individuals composing it.

In the series from the Lingadzi the hamule agrees very well with what is found in two Gold Coast specimens determined for me as *brachiale* by Dr. Ris, who pointed out that in those specimens the hamule is larger than in the male from Nossi-bé figured in his monograph (*loc. cit.* p. 199) and in others seen by him from the Congo, etc. In these Nyasa-land and Gold Coast males of *brachiale* the hamule, viewed in profile, is more like that of *chrysostigma*, but differs from it in having the hook terminating the internal branch shorter and slenderer, and also in having the external branch larger, rounder, and more prominent.

In addition to the nine males captured with prey, Dr. Lamborn sent home forty-two others taken in the same locality. Of these fifty-one specimens, forty-nine prove to have a more or less common type of hamule (of which fig. 2 may be taken as an example), one has the form figured by Ris for *brachiale* (fig. 1), and the remaining example may be referred to *chrysostigma* (fig. 3). It may be observed that the kind of hamule represented in fig. 1 is barely distinguishable from that of *O. stemmale wrighti*, from Seychelles. Moreover, the antenodals of that particular specimen of *O. brachiale* happen to be dark, like those of the other insect mentioned. Nevertheless, the two species can always be distinguished from each other by the difference in the coloration of the head and the costa.

When not obscured by pruinosity or by post-mortem changes, the coloration of the thorax is normally quite different in the two species, although the pattern itself remains much the same in both. In *chrysostigma* the dorsum is yellowish brown as far as the dark brown antehumeral streak, and the lower part of the mesepisternum is pale brown; a broad ivory-white stripe lies just below the humeral

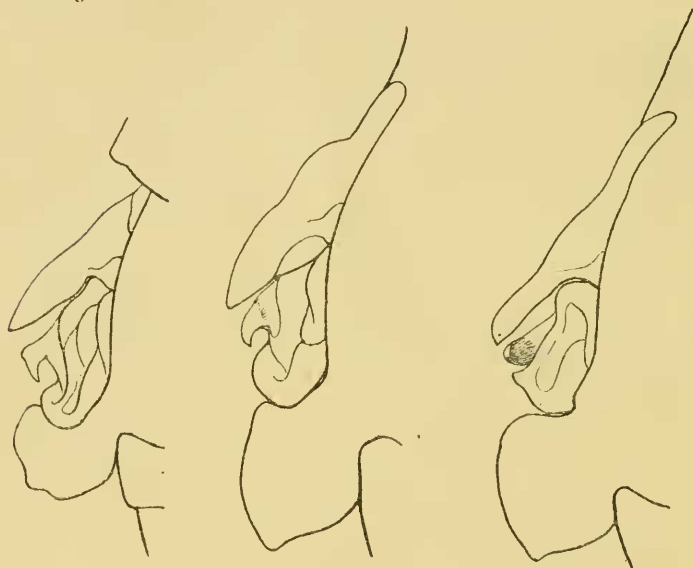
suture, and is bordered on each side by a streak of dark brown; otherwise, the sides of the thorax are yellowish brown.

In characteristic examples of *brachiale*, on the other hand, the ground-colour is greenish throughout, with dark markings as in *chrysostigma*, added to which there are two dark stripes crossing the metathorax; but in Nyasaland, at least, the dorsum tends to become very pale, and the mesepimeral stripe tends to take on a whitish hue. Just as the Lingadzi specimens of *brachiale* vary in the direction of *chrysostigma*,

Fig. 1.

Fig. 2.

Fig. 3.



Genitalia of three males of *Orthetrum* from the Lingadzi River, Nyasaland.

Fig. 1.—*O. brachiale*, P. de B., 23. ii. 15.

Fig. 2.—*O. brachiale*, P. de B., 4. iii. 15.

Fig. 3.—*O. chrysostigma*, Burm., 8. ii. 15.

P. Highley, cam. luc. et del.

so do the Monkey Bay examples of *chrysostigma* vary in the direction of *brachiale*, and in many cases the thoracic colour-scheme affords little guidance to the identification of the species.

The black markings on the abdomen are distributed in different ways in the two species, but, as they are seldom visible in dried specimens, they are not of much value as aids to identification. When semi-adult individuals are met with,

however—individuals, that is, which are free alike from pruinosity and discoloration—it is seen that *chrysostigma* lacks the mid-dorsal black line and certain other black markings which characterize the abdomen of *brachiale*. The condition of the Nyasaland specimens now under consideration does not permit of any useful comparison of abdominal markings being made, either between themselves or with suitably preserved material of *chrysostigma* and *brachiale* from other localities.

The older males of *brachiale* from the Lingadzi have the distal two-thirds of their wings tinged with brown. In the female sex the colour is more intense and suffuses the entire wing. In the males of *chrysostigma* from Monkey Bay the wings remain clear, and very little colour makes its appearance in the wings even of the females.

The eyes of the Lingadzi *brachiale* are decidedly green in both sexes, whereas the eyes of the *chrysostigma* from Monkey Bay are consistently brown. I have no notes as to the eye-colours in the living insects.

The entire collection of captors and prey, set out in the subjoined tables (pp. 243–245), has been presented to the British Museum (Natural History) by the Imperial Bureau of Entomology.

From the Lingadzi River District, Nyasaland (Dr. W. A. Lamborn).

Collector's no.	Species of Odonata.	Species of Prey.	Date.
42 a.	<i>Orthetrum brachiale</i> , P. de B., ♂.	<i>Glossina morsitans</i> , Westw.	8. ii. 15.
42 b.	<i>O. brachiale</i> , ♂.	<i>G. morsitans</i> .	10. ii. 15.
42 c.	<i>O. brachiale</i> , ♂.	An undetermined Asilid fly.	10. ii. 15.
42 d.	<i>O. brachiale</i> , ♂.	A Tachinid fly (<i>Setulia fasciata</i> , Meig.). Identified by Dr. J. Villeneuve.	11. ii. 15.
42 e.	<i>O. brachiale</i> , ♂.	A Tachinid fly (<i>Tachina</i> sp.—in poor condition).	12. ii. 15.
42 f.	<i>O. brachiale</i> , ♂.	A Tachinid fly (<i>Sarcophaga</i> sp., ♀—indeterminable).	12. ii. 15.
42 g.	<i>O. icteromelas</i> , Ris, ♀.	The Tabanid fly <i>Tabanus fuscipes</i> , Ric.	14. ii. 15.
42 h.	<i>O. icteromelas</i> , ♀.	<i>Glossina morsitans</i> .	15. ii. 15.
42 i.	<i>O. chrysostigma</i> , Burm., ♀.	A Tachinid fly (<i>Setulia fasciata</i> , Meig.). Identified by Dr. J. Villeneuve.	16. ii. 15.
42 j.	<i>O. brachiale</i> , ♂.	An undetermined Asilid fly.	17. ii. 15.
42 k.	<i>O. brachiale</i> , ♂.	A Syrphid fly (<i>Lathyrphthalmus</i> sp., near <i>metallescens</i> , Loew).	17. ii. 15.
42 l.	<i>O. brachiale</i> , ♂.	A Syrphid fly (<i>Melanostoma</i> ? <i>floripeta</i> , Speis.).	19. ii. 15.

From the Monkey Bay District, Nyasaland (Dr. W. A. Lamborn).

Collector's no.	Species of Odonata.	Species of Prey.	Date.	Remarks.
81 a.	<i>Orthetrum chrysostigma</i> , ♀.	<i>Glossina morsitans</i> .	25. iv. 15.	"Seen to take a tsetse, which it ate before I could catch it."—W. A. L.
81 b.	<i>O. chrysostigma</i> , ♂.	<i>G. morsitans</i> .	23. iv. 15.	
81 c.	<i>O. chrysostigma</i> , ♂.	A Muscid fly, <i>Musca</i> sp. (too much damaged for complete identification).	23. iv. 15.	
81 d.	<i>O. chrysostigma</i> , ♂.	<i>Glossina morsitans</i> .	23. iv. 15.	"Seen to take a tsetse while hovering round a native party, but, as it retired to a distance, it ate all its prey before capture."—W. A. L.
81 e.	<i>O. chrysostigma</i> , ♂.	<i>G. morsitans</i> .	23. iv. 15.	
81 f.	<i>O. chrysostigma</i> , ♂.	<i>G. morsitans</i> .	24. iv. 15.	"This was felt to brush my forehead on the wing as I was digging for tsetse pupæ. When it settled I saw that it had taken a tsetse."—W. A. L.
81 g.	<i>O. chrysostigma</i> , ♂.	<i>G. morsitans</i> .	24. iv. 15.	"Seen to take prey.
81 h.	<i>O. chrysostigma</i> , ♂.	The Nemestrinid fly <i>Atrialops vespertilio</i> , Loew. Identified by Mr. F. W. Edwards.	24. iv. 15.	
81 i.	<i>O. chrysostigma</i> , ♀.	A Cercopid bug, received in poor condition, but apparently belonging to the genus <i>Clavia</i> .	3. v. 15.	Found feeding on prey.

81 j.	<i>O. chrysostrigma</i> , ♂.	<i>Glossina morsitans</i> .	3. v. 15.	"Seized its prey to one side of me, and this turned out to be a tsetse. I was returning from a place 2 miles distant where tsetse abound, but I was unaware that any were following me."— <i>H. A. J.</i>
81 k.	<i>O. chrysostrigma</i> , ♂.	<i>G. morsitans</i> .	6. v. 15.	
81 l.	<i>O. chrysostrigma</i> , ♀.	<i>G. morsitans</i> .	6. v. 15.	
81 m.	<i>O. chrysostrigma</i> , ♂.	<i>G. morsitans</i> .	6. v. 15.	"Felt and heard to brush against my shoulder after a tsetse unsuccessfully. It then made a second attempt to secure a tsetse on the wing, again unsuccessfully, and finally it caught one which I drove off my leg."— <i>H. A. J.</i>
81 n.	<i>O. chrysostrigma</i> , ♂.	<i>G. morsitans</i> .	8. v. 15.	
81 o.	<i>O. chrysostrigma</i> , ♂.	<i>G. morsitans</i> .	8. v. 15.	
81 p.	<i>O. chrysostrigma</i> , ♀.	<i>G. morsitans</i> .	8. v. 15.	
81 q.	<i>O. chrysostrigma</i> , ♀.	<i>G. morsitans</i> .	10. v. 15.	
81 r.	<i>O. chrysostrigma</i> , ♂.	<i>G. morsitans</i> .	10. v. 15.	"Seen to catch tsetse."
81 s.	<i>O. chrysostrigma</i> , ♀.	<i>G. morsitans</i> .	10. v. 15.	
81 t.	<i>O. chrysostrigma</i> , ♂.	<i>G. morsitans</i> .	10. v. 15.	
81 u.	<i>O. chrysostrigma</i> , ♀.	<i>G. morsitans</i> .	10. v. 15.	
81 v.	<i>O. chrysostrigma</i> , ♀.	<i>G. morsitans</i> .	10. v. 15.	
81 w.	<i>O. chrysostrigma</i> , ♂.	<i>G. morsitans</i> .	12. v. 15.	
83 a.	<i>Crocothemis erythræa</i> , Brullé, ♀.	The Bombyliid fly <i>Thyridanthrax</i> ?	8. v. 15.	
84 a.	<i>Orthetrum chrysostrigma</i> , ♂.	<i>abruptus</i> , Loew. Identified by Mr. F. W. Edwards.	9. v. 15.	